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IS 12215 (1987): Code of practice for selection of belt feeders [MED 6: Continuous Bulk Conveying, Elevating, Hoisting Aerial Ropeways and Related Equipment]



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Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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Indian Standard

CODE OF PRACTICE FOR SELECTION OF BELT FEEDERS

1. Scope — Lays down the code of practice for selection of belt feeders.

2. Application — Belt feeders are used under bins, hoppers and other type of containers. These will handle practically any bulk material which is not too large, hot or will not adhere unduly to the belt.

3. Construction — Belt feeders are similar in construction to belt conveyors and consist of endless belts operating over supporting idlers between head and tail pulley terminals. An illustration is given in Fig. 1. Conveyor belts with heavy rubber cover on the carrying side are used to carry the material. Closely spaced flat or troughed belt idlers provide the necessary support for the belt and the material. Skirt plates extend to the full length of the feeder to confine the material and provide necessary depth for desired capacity or lump size.

3.1 Self-contained, sturdy steel frames support and align the head and tail shafts, intermediate idlers and the continuous skirt plates. Adjustable rubber strips along the lower edge of the skirt plates reduce belt clearance and acts as seals, and prevent possible leakage. Feeder belt, idlers, and head and tail pulleys shall conform to IS : 1891 (Part 1) - 1978 'Specification for rubber conveyor and elevator belting : Part 1 General purpose belting (second revision)', IS : 8598-1987 'Specification for idlers and idler sets for belt conveyors (first revision)' and IS : 8531-1986 'Specification for pulleys for belt conveyors (first revision)' respectively.

3.1.1 The idler size and type for use with the belt feeder is generally similar to that required for belt conveyors. However, spacing of the idlers in belt feeder may be different than those in case of belt conveyors and may be suitably selected at design stage.

3.2 Belt Width (W) — Belt width in relation to maximum lump size of material shall be selected in accordance with IS : 11692-1985 'Code of practice for selection and design of belt conveyors'. See Fig. 1 for belt width W nomenclature.

3.3 Width of Belt Across Skirt Plates (D) — In general, the maximum dimension of width of belt across skirt plates shall not be more than two-thirds the width of the belt W . For flat belt, depending upon how well it is supported by idlers and how effectively the skirt rubber seals are maintained, width of belt across skirt plates (dimension D) may be increased more than two-thirds the width of belt (W). However, width of belt across skirt plates, that is, dimension D shall be suitably selected while designing the belt feeder. See Fig. 1 for width of belt across skirt plates D nomenclature.

3.4 Height of Skirt Plates (H) — The height of skirt plates shall be sufficient to contain the volume of material as it is loaded on the belt. The height of skirt plates depends upon the lump size of material, troughing angle of idlers used and capacity of belt feeder, and this shall be suitably selected while designing the belt feeder. See Fig. 1 for height of skirt plates H nomenclature.

3.5 Variable speed drives are recommended for belt feeders.

4. Capacity — The capacity of the belt feeder depends on the speed of the belt, width of the belt across the skirt plates, height of the skirt plates, troughing angle of idlers used and bulk density of material to be handled.

4.1 Capacity Calculation for Horizontal Belt Feeder — An example (for illustration only) for calculating the capacity of a horizontal belt feeder is given below :

Example

$$\begin{array}{l} \text{Belt feeder capacity} \\ \text{in tonnes per hour} \end{array} = 0.75 \times A \times V \times S \times 60$$

where

A = theoretical cross-section of skirt plates in m^2 and is equal to $D \times H$ for feeder with flat belt;

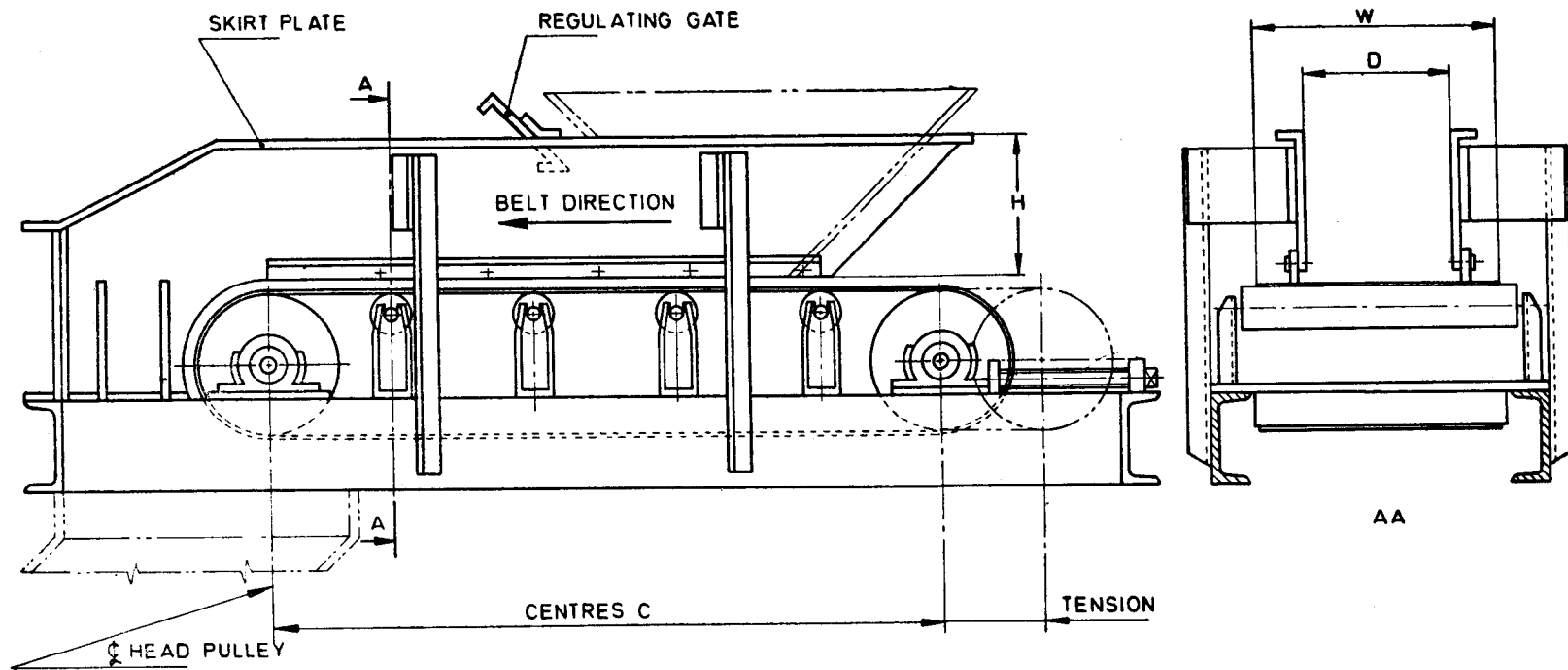


FIG. 1 BELT FEEDER (WITH FLAT BELT) ILLUSTRATION

V = belt speed in m/minute;

S = bulk density of material in tonne/m³;

0.75 is a factor of loading and, in the given example, this factor has been assumed to be 0.75, that is, the skirt plates are considered loaded 75 percent of theoretical cross-section A available; and

60 is the multiplying factor to obtain the capacity per hour, V being the belt speed in m/minute.

4.2 Maximum Belt Speed — Maximum recommended belt speed is 15 m/minute for abrasive materials and materials with large size lumps, and 30 m/minute for non-abrasive materials and materials with small size lumps.

5. Feed Chutes — For handling large lump sizes or where the material is likely to fall on the belt feeder from a height, special feed chutes shall be provided to avoid severe impact and prevent damage to the belt.

6. Regulating Gates — Adjustable regulating gates may be furnished where required. These shall be provided with skirt plates.

7. Take-up Device — Generally a screw type take-up device shall be provided on all the belt feeders. Any special requirements shall be as agreed to between the purchaser and the manufacturer.

8. Angle of Inclination — Angles of inclination and declination shall be suitably selected as these shall effect the feeder capacity. Maximum recommended angle of inclination is 10 degrees.

9. Belt Cleaners — Suitable external and internal belt cleaners shall be provided for belt feeder.

10. Peripheral Force Required on Drive Pulley and kW Rating of Motor — These parameters shall be calculated in accordance with IS : 11692-1985 to which any pullout resistance due to column height of material in the hopper above the skirt plates shall be added. This pullout resistance shall depend upon type of material length of hopper connected with skirt plates and column height of material in the hopper above skirt plates and some of the other parameters. Hence, these parameters shall be decided while designing the belt feeder.

10.1 After calculating peripheral force on drive pulley and with selected belt speed with due consideration of drive efficiency required, kW rating and other parameters of the motor shall be calculated in accordance with IS : 11692-1985.

11. Data to be Supplied by the Purchaser — Following information shall be supplied by the purchaser with his enquiry/order:

- 1) Material to be conveyed;
- 2) Material conditions — wet, dry, sticky, greasy, abrasive, and if hot, temperature to be stated;
- 3) Bulk density of material in kg/m³;
- 4) Size of largest lumps (3 dimensions);
- 5) Average size of material;
- 6) Percentage of largest pieces;
- 7) Corrosive reactions on metals, if any;
- 8) Belt feeder capacity in tonne per hour:
 - a) Rated; and
 - b) Design ;
- 9) Amount of lift;
- 10) Shaft centres (centres of head and tail pulleys);
- 11) Any restriction on position of drive unit;
- 12) Type of cable entry required;
- 13) Electric power supply details;

- 14) Special safety precautions required;
- 15) Sketch of proposed belt feeder required with its location with respect to hopper, bin and other type of containers under which it shall be required to work;
- 16) Statutory requirement applicable;
- 17) Details of spare parts required; and
- 18) Any special features of belt feeder required by the purchaser.

12. Data to be Supplied by the Manufacturer — Following information shall be furnished by the manufacturer to the purchaser:

- 1) Width of belt recommended;
- 2) Belt speed in m/minute;
- 3) Specifications of belt;
- 4) Power required:
 - a) At drive pulley shaft; and
 - b) At motor shaft;
- 5) Details of drive unit;
- 6) Pulley diameter, diameter of shaft and type of bearing (ball/roller);
- 7) Details of idlers;
- 8) Peak capacity of belt feeder when handling the specified material;
- 9) Details of take-up device;
- 10) Type and location of belt cleaners;
- 11) Dimensional general arrangement drawing of belt feeder; and
- 12) List of spares, if called for in the enquiry order.

13. Other Requirements — Other requirements, such as quality of material, components, durability aspects shall be as agreed to between the purchaser and the manufacturer.

Note — Return idlers shall be provided for belt feeders with centres (C) more than 3 m.

EXPLANATORY NOTE

The criterion for selection of belt feeders given in this standard are expected to provide guidelines to the manufacturers while designing and manufacturing, and to the users while selecting the belt feeders for their requirements.

A reference to following Indian Standards may further be useful to help selection of feeder regarding some of the aspects not covered in this standard:

- IS : 1891 Specification for rubber conveyor and elevator belting,
(Part 1)-1978 General purpose belting (*second revision*),
(Part 2)-1978 Heat resistance belting (*first revision*),
(Part 3)-1978 Oil-resistant belting (*first revision*),
(Part 4)-1978 Hygienic belting,
- IS : 7155 Code of recommended practice for conveyor safety (*first revision*),
(Part 1)-1986 General information,
(Part 2)-1986 General safety requirements,
(Part 3)-1986 Belt conveyors and feeders, and
- IS : 11592-1985 Code of practice for selection and design of belt conveyors.